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ARMORED DIVISION BRIGADE ENGINEER SUPPORT

An habitually associated divisional engineer battalion normally supports a divisional maneuver brigade. The division commander allocates engineer assets according to his overall tactical plan. When the brigade is committed, corps engineer augmentation usually provides the brigade with the equivalent of a battalion or more of engineers.

SEPARATE BRIGADE ENGINEERS LIGHT DIVISION BRIGADE ENGINEER SUPPORT

The separate brigade receives its engineer support from its organic engineer company. Corps engineers usually augment this company. The separate brigade also has a brigade engineer on the staff.

The brigade commander normally allocates at least an engineer platoon to the task force and augments it with additional assets depending on the task force mission.

The light maneuver brigade receives a light division engineer company. The light brigade also has an assistant brigade engineer on staff.

ENGINEER CAPABILITIES

Engineers are a combat multiplier. They provide skills and equipment necessary to assist the task force in accomplishing mobility, countermobility, and survivability tasks.

MOBILITY support seeks to improve movement of maneuver forces and critical supplies by reducing or eliminating obstacles, breaching minefields, and improving routes for maneuver and supply.

COUNTERMOBILITY support involves construction of obstacles to delay, canalize, disrupt, or kill the enemy. It also increases target acquisition time and, therefore, the effectiveness of direct and indirect fire weapons systems.

SURVIVABILITY support refers to the construction of vehicle fighting positions and dismounted fighting positions with overhead protection to reduce the effectiveness of enemy weapons.

Combat engineers primarily hand-emplace and breach obstacles, and augment the TF reconnaissance effort.

■ KEY ENGINEER EQUIPMENT ■

Combat engineers employ certain key equipment.

- The engineer platoon has organic mine detectors, demolition kits, carpenter and pioneer tool kits, and one 5-ton dump truck. The platoon will also have two M9 armored combat earthmovers (ACEs) with bulldozing capability and the mine clearing line charge (MICLIC). MICLIC is a trailer-mounted, rocket-projected explosive line charge that is towed within 50 feet of a minefield to clear a lane 5 to 8 meters wide and 100 meters long.
- Additional engineer equipment that the platoon can request from the engineer company includes:
 - Small emplacement excavator (SEE). The SEE has a backhoe, bucket loader, and other attachments such as a handheld hydraulic rock drill, chain saw, and pavement breakers.
 - Armored vehicle launched bridge (AVLB). The AVLB is a basic M48 or M60 tank chassis modified to transport, launch, and retrieve a 60-foot span, Class 60 bridge. The bridge is capable of carrying military load classification (MLC) 60 track loads across a 17-meter gap and MLC 70 track loads across a 15-meter gap.
 - Combat engineer vehicle (CEV). The CEV is a basic M60A1 tank with a hydraulically operated dozer blade, a 165-mm turret-mounted demolition gun, a retractable boom, and a winch. The gun provides direct fire support for obstacle reduction or against bunkers or buildings.

continued

- **Volcano.** The Volcano is a scatterable mine system. It provides a single mine delivery system that can be dispensed from the air in a UH-60 Blackhawk helicopter or from the ground using a wheeled or tracked cargo vehicle. (5-ton cargo, M548, etc.). A single system contains 960 mines (160 cannisters) in a ratio of five antitank (AT) and one antipersonnel (AP) mines per cannister. The AT mines are magnetically fused and deployed trip wires activate the AP mines. An explosive charge projects the mines out of the cannister into the minefield. The mines have three fixed settings for self-destruct time: 4 hours, 48 hours, or 15 days. The standard dimensions for an air delivered Volcano minefield are 35m x 1,115m. A well-trained aircrew can emplace a 1,110 meter minefield in approximately 10 min. One load of mines will emplace two standard minefields.

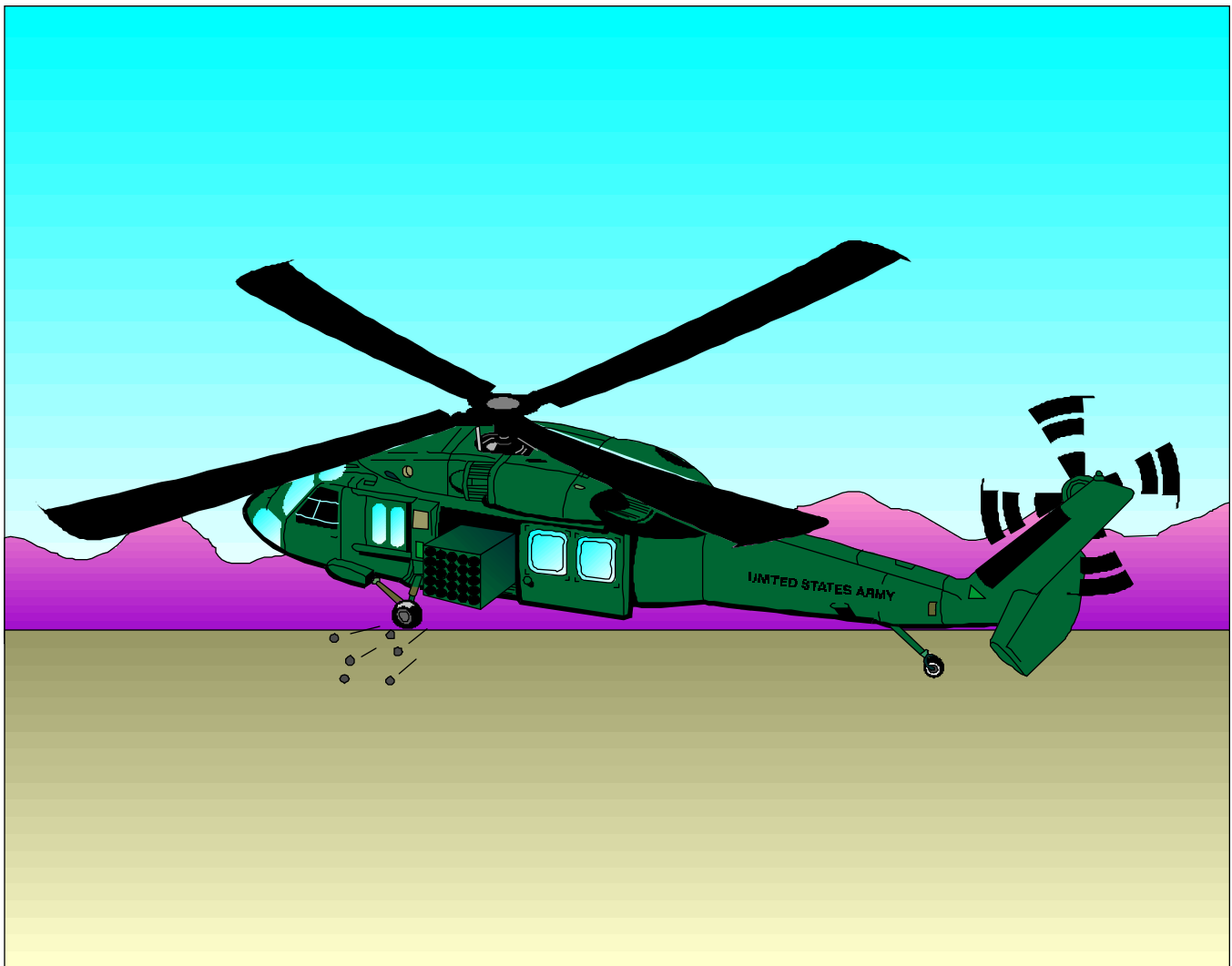


Figure 8-1. Multiple-Delivery Mine System (Volcano). (FM 20-32).

EMPLOYMENT CONSIDERATIONS

The engineer battalion control engineer assets. Engineer assets may be attached, OPCON, direct support or general support to maneuver task forces in support of the maneuver brigade operation.

- The senior supporting engineer must coordinate the execution of engineer tasks.
- During mobile operations, employment of the platoon is under task force control and it is positioned to move quickly to likely obstacles.
- The task force provides support in the form of security for engineer work parties, additional manpower, and CSS.
- Engineer elements will frequently shift from supporting one company to another and are given priority of equipment usage for a specified period or for the construction of a specified number of fighting positions.
- During offensive operations, engineers assist the task force's maneuver over existing terrain and obstacles. The engineers assist in:
 - Crossing gaps.
 - Bridging rivers.
 - Breaching or constructing bypasses around minefields, fortified positions, and other obstacles.
 - Emplacing minefields on exposed flanks.
 - Preparing positions for overwatch.
 - Constructing and maintaining combat roads and trailers.
- In the defense, engineers are a critical asset. They use the terrain to enhance the mobility and survivability of the task force while simultaneously impairing the mobility of the enemy. The commander must decide whether engineers are to build obstacles, prepare protective positions, or cut routes between battle positions. Prioritization of tasks for special equipment such as bulldozers and bucketloaders is essential. Engineers must begin their work for the task force as soon as the defensive mission is received.

ENGINEERS FIGHT AS INFANTRY

Engineers have a secondary mission of fighting as infantry. Engineers also may have to fight as infantry in the normal execution of their mission. Engineers fighting as infantry do not have organic combat support; they will require additional support in the form of mortars, antitank assets, and artillery.

COMMANDER'S GUIDANCE FOR MOBILITY/ SURVIVABILITY OPERATIONS

In preparation for execution of engineer battlefield functions of mobility/survivability, the commander's guidance should provide the following information as appropriate.

- Give general intent for the engineer effort.
- State priority of support by unit, BP, EA, and/or phase
- Give intent for obstacles' effects (disrupt, fix, turn, block)
- Focus digging assets--state survivability level and priorities (by system)
- Identify mobility requirements (routes, lanes, LD time).
- Define intent of FASCAM employment (by system--where, when, duration, and authority)
- Specify any use of maneuver forces for obstacle effort.

OBSTACLE PLANNING (FM 5-102, FM 5-100, FM 5-71-100)

Obstacle planning begins with understanding the fundamentals of the obstacle framework. Precise use of these terms creates a common language and prevents confusion during planning and execution. The terms are presented in the following general categories:

- Obstacle classification
- Obstacle intent
- Obstacle protection
- Obstacle C2

■ OBSTACLE CLASSIFICATION ■

Obstacle classification consist of two types of obstacles: existing obstacles and reinforcing obstacles.

- Existing obstacles are obstacles that are present in the battlespace as inherent aspects of the terrain.
 - The two types of existing obstacles are natural (terrain features), and cultural (man-made terrain features).
- Reinforcing obstacles are obstacles that military forces specifically construct, emplace, or detonate to reduce threat mobility.
 - The two types of reinforcing obstacles are tactical and protective.
 - Tactical obstacles directly attack the threat's ability to move, mass, and reinforce.
 - The three types of tactical obstacles are directed, situational, and reserve.
 - Directed obstacles are specific obstacles tasked to a subordinate unit.
 - Situational obstacles are obstacles that units plan, and possibly prepare, before beginning an operation; however, they do not execute the obstacle unless specific criteria are met.
 - Reserve obstacles are obstacles for which the commander restricts execution authority (on-order obstacles).
 - Tactical obstacle design is based on the intended obstacle effect and formation of the threat.
 - Tactical obstacles are designed to disrupt, turn, fix, or block the threat's maneuver. Protective obstacles are a key component of survivability operations.

- The two types of protective obstacles are hasty and deliberate.
 - Hasty protective obstacles are temporary in nature and support the defending force's position from the threat's final assault.
 - Deliberate protective obstacles are more permanent and require more detailed planning than hasty protective obstacles.

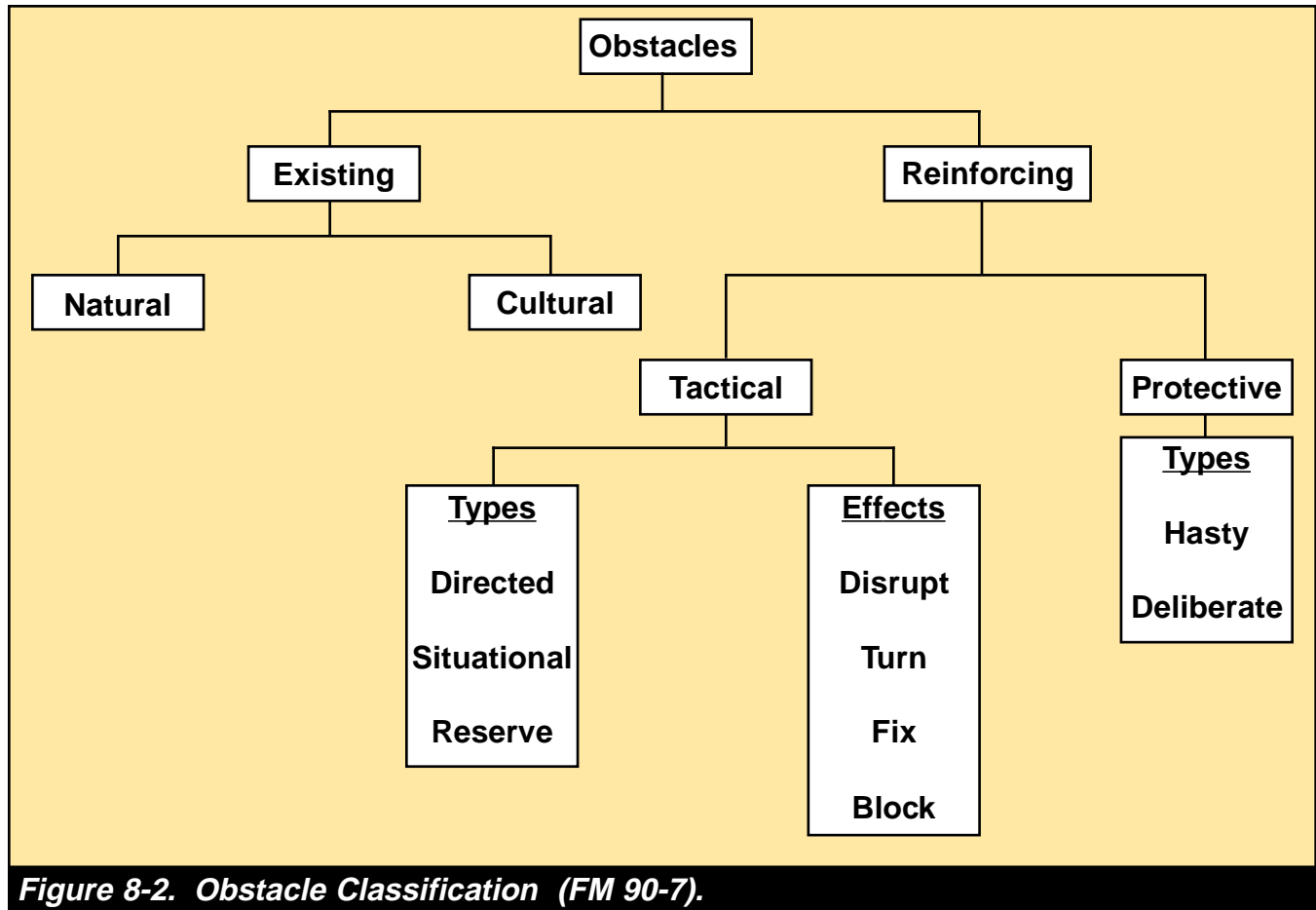


Figure 8-2. Obstacle Classification (FM 90-7).

■ OBSTACLE INTENT ■

Obstacle intent is how the commander wants to use tactical obstacles to support his scheme of maneuver. Obstacle intent consists of a target, obstacle effect, and relative location. Target is defined as the threat force's size and type along an avenue of approach. Effect is achieved through the integration of both fires and obstacles to manipulate the threat's movement in support of the commander's scheme of maneuver. All tactical obstacles should disrupt, turn, fix, or block the enemy. Relative location is where the commander wants the desired effect on the target.

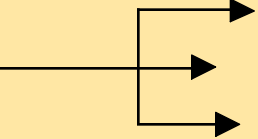
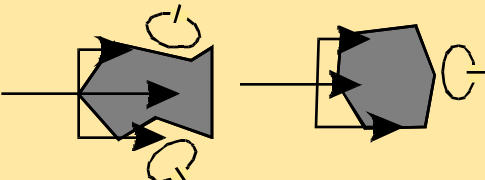

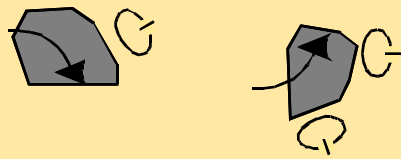

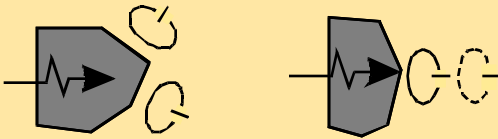

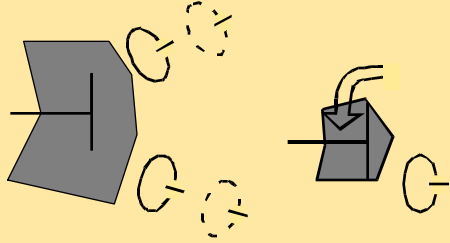
Obstacle Effect Graphic	Application	Examples Conveying Intent
Disrupt 	<p>Short arrow indicates where enemy is attacked by obstacles.</p> <p>Long arrows indicate where the enemy is allowed bypass and is attacked by fires.</p>	
Turn 	<p>Heel of arrow is anchor point.</p> <p>Direction of arrow indicates desired direction of turn.</p>	
Fix 	<p>Irregular part of arrow indicates where obstacles slow enemy advance.</p>	
Block 	<p>The ends of the vertical line indicate the limit of enemy advance.</p> <p>The ends of the vertical line also indicate where obstacles tie in to NO-GO terrain.</p>	
<p style="text-align: right;">Direction of Enemy Attack →</p>		

Figure 8-3. Obstacle Effect Graphics (FM 90-7).

■ OBSTACLE PROTECTION ■

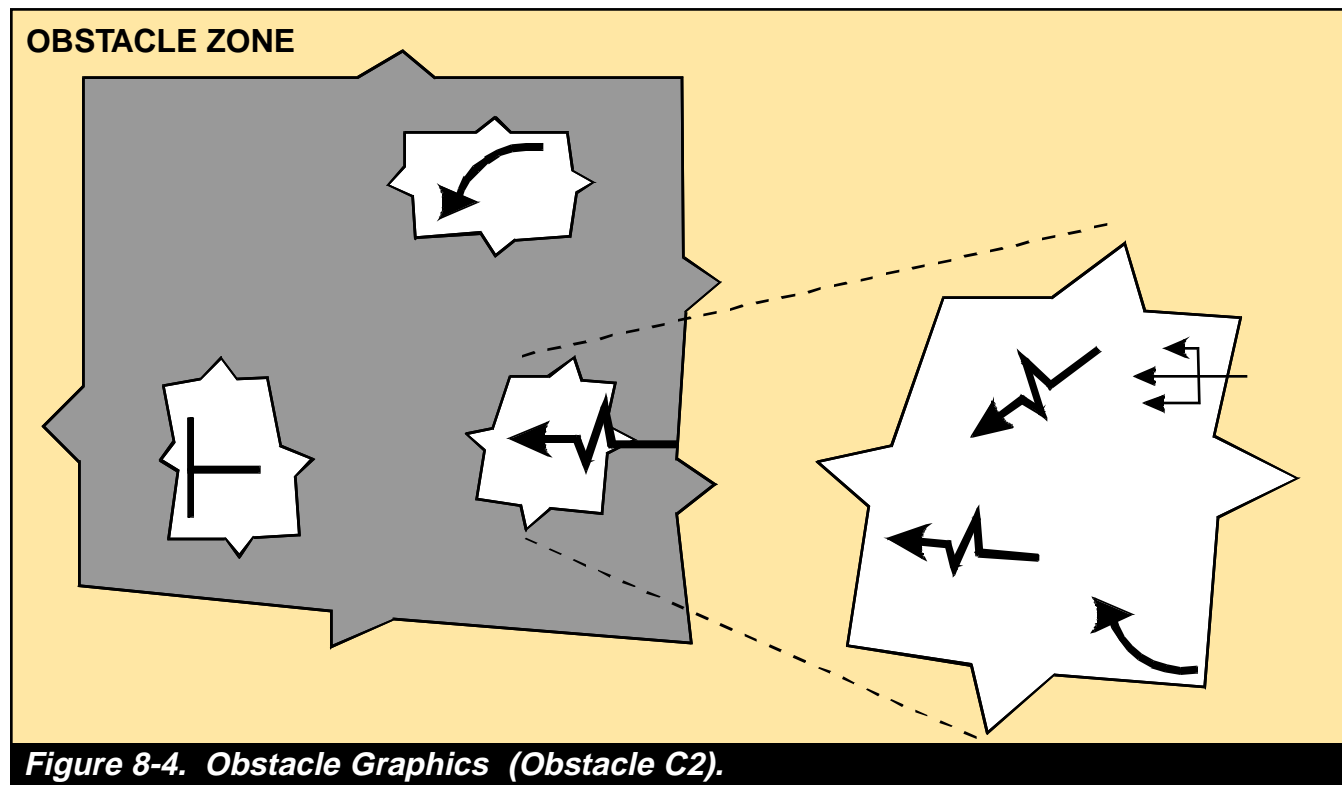
Obstacle protection is protecting the integrity of obstacles. This protection can be achieved through counterreconnaissance, breach asset destruction, obstacle repair, and using phony obstacles. Counterreconnaissance prevents the threat from gathering information on friendly preparation. The reconnaissance and surveillance plan includes obstacle protection as part of the counterreconnaissance plan. Early breach asset destruction will reduce the threat's ability to maneuver and ensure maximum effectiveness of the obstacles. Obstacle repair must occur when the threat has attempted to breach tactical obstacles and during lulls in the battle, between echelons. Phony obstacles add to the deception within the battlespace.

■ OBSTACLE EMPLACEMENT ■

Obstacle C2 focuses on obstacle emplacement authority and obstacle control. Obstacle emplacement authority is the authority that a unit commander has to emplace reinforcing obstacles.

Obstacle control is the control that commanders exercise to ensure that obstacles support current and future operations. The commander uses control measures, specific guidance, and orders to maintain obstacle control. Obstacle control measures are specific control measures that simplify granting obstacle emplacement authority and providing obstacle control.

OBSTACLE-CONTROL MEASURES (FM 90-7)				
Obstacle-Control Measure	Echelon	Specific Obstacle Effect	Size of Enemy Avenue of Approach/Mobility Corridor	
			Armored	Light
Zone	Division Corps	Optional, not Normal	Division/ Brigade	Brigade/ Battalion
Belt	Brigade	Optional, not Normal	Brigade/ Battalion	Battalion/ Company
Group	Task Force Brigade Division Corps	Mandatory	Battalion/ Company	Company/ Platoon
Restrictions	Corps Division Brigade Task Force	Not Applicable	Not Applicable	Not Applicable



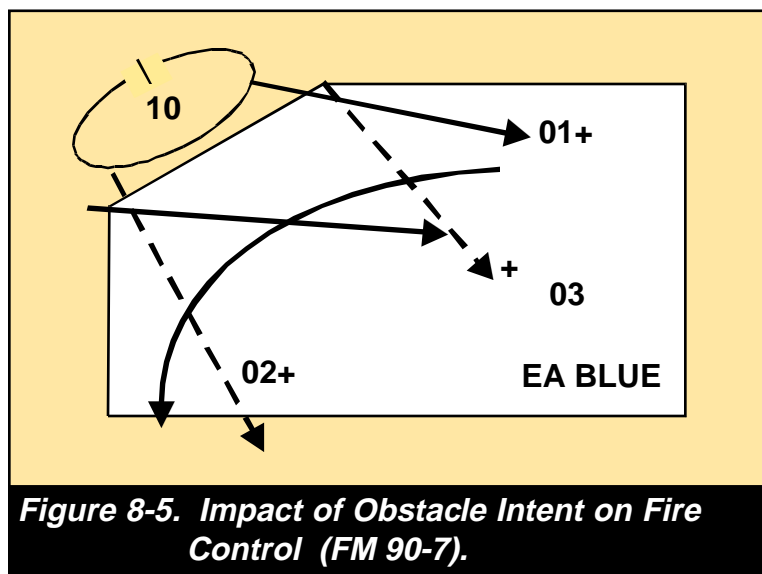
Obstacle zones are a graphic control measure that corps and division commanders use to grant obstacle emplacement authority to brigades, regiments and other major subordinate units. Obstacle belts are the graphic control measure, within an obstacle zone, that brigade commanders use to constrain tactical obstacle emplacement. Obstacle groups are one or more individual obstacles, within an obstacle belt, grouped to provide a specific obstacle effect. All levels of command use obstacle restrictions as an additional control measure to prevent emplacement of obstacles that may impair future friendly operations.

■ OBSTACLE-INTEGRATION PRINCIPLES ■

Obstacle integration is the process of ensuring that the obstacle effects support the scheme of maneuver. Obstacle integration cuts across all functional areas and all echelons of command. Commanders and staffs consider intelligence, obstacle intent, fires and obstacle effects, obstacles and operations in depth, obstacle control and echelons of obstacle planning, to ensure that obstacles have the desired impact on the battle.

■ INTELLIGENCE AND OBSTACLES ■

Intelligence is a key component to success within the battlespace. It gives the commander the ability to visualize the battlespace. Staffs conduct terrain analysis, and determine the threat force's size and vulnerability to assist the commander in conceptualizing the operation. Terrain analysis is based on the five military aspects of terrain: observation and fields of fire, cover and concealment, obstacles, key terrain, and avenues of approach (OCOKA). Use the threat force size and the terrain to identify locations where the threat may change formations. Attack the threat's vulnerability by integrating fires and obstacles that the threat does not have the assets to breach.



■ FIRES AND OBSTACLES ■

There are four combinations of fires and obstacles. They are: fires and disrupt effect, fires and turn effect, fires and fix effect, and fires and block effect. Fires and disrupt effect attack the threat's operational tempo and deceive the threat about friendly defensive positions. Fires and turn effect divert an enemy formation from one avenue of approach to an adjacent avenue of approach or to an engagement area. Fires and fix effect slow an attacker within a specified area, normally an engagement area, to defeat the threat in detail or to gain necessary time for force repositioning while inflicting maximum casualties. Fires and block effect stop an attacker along a specific avenue of approach or prevent the enemy from advancing through the engagement area.

■ OBSTACLES AND OPERATIONS IN DEPTH ■

The commander uses obstacles and operations in depth within the battlespace to support deep, close, and rear operations. In deep offensive operation, obstacles help interdict enemy forces or reserves. In deep defensive operations, obstacles attack threat follow-on formations or subsequent echelons. In close offensive operation, obstacles support the defeat of the defending threat forces by attacking reserve and reinforcing units. In close defensive operations, commanders integrate all types of obstacles to slow, canalize, and defeat the threat's major units. In rear offensive operations, obstacles are mostly of the hasty protective type. In the defense, deliberate protective obstacles are common around strong points and fixed sites.

■ OBSTACLE CONTROL ■

Obstacle control varies with echelon and METT-T. To control obstacles, commanders focus or withhold obstacle-emplacement authority or restrict obstacles. Commanders and staffs consider current operations, maximum flexibility, and future operations when planning obstacle control. Obstacle control for current operations focuses the obstacle effort to support the scheme of maneuver and prevent obstacles from interfering with current operations. Control maximizes the flexibility of subordinates to employ obstacles to support their missions. Obstacle control for future operations must facilitate the operation; obstacles that are emplaced to support just the current operation must not hinder the future operation.

■ OBSTACLE PLANNING ■

Echelons of obstacle planning integrate obstacles from corps to company team through corps-level planning, division-level planning, brigade-level planning. Corps-level obstacle planning primarily centers on controlling obstacles through restrictions that ensure division obstacles do not interfere with the corps scheme of maneuver and future operations. Division-level obstacle planning is more directive; it uses of zones to give major subunits the authority for obstacle emplacement and to prevent obstacle interference with corps- or division-level operation. Brigade-level obstacle planning focuses on belts that give TF's emplacement authority, on restrictions, and on situational and reserve obstacle groups. Task forces conduct the majority of the detailed planning that focuses on the detailed design and siting plans to execute the obstacle groups planned at higher levels.

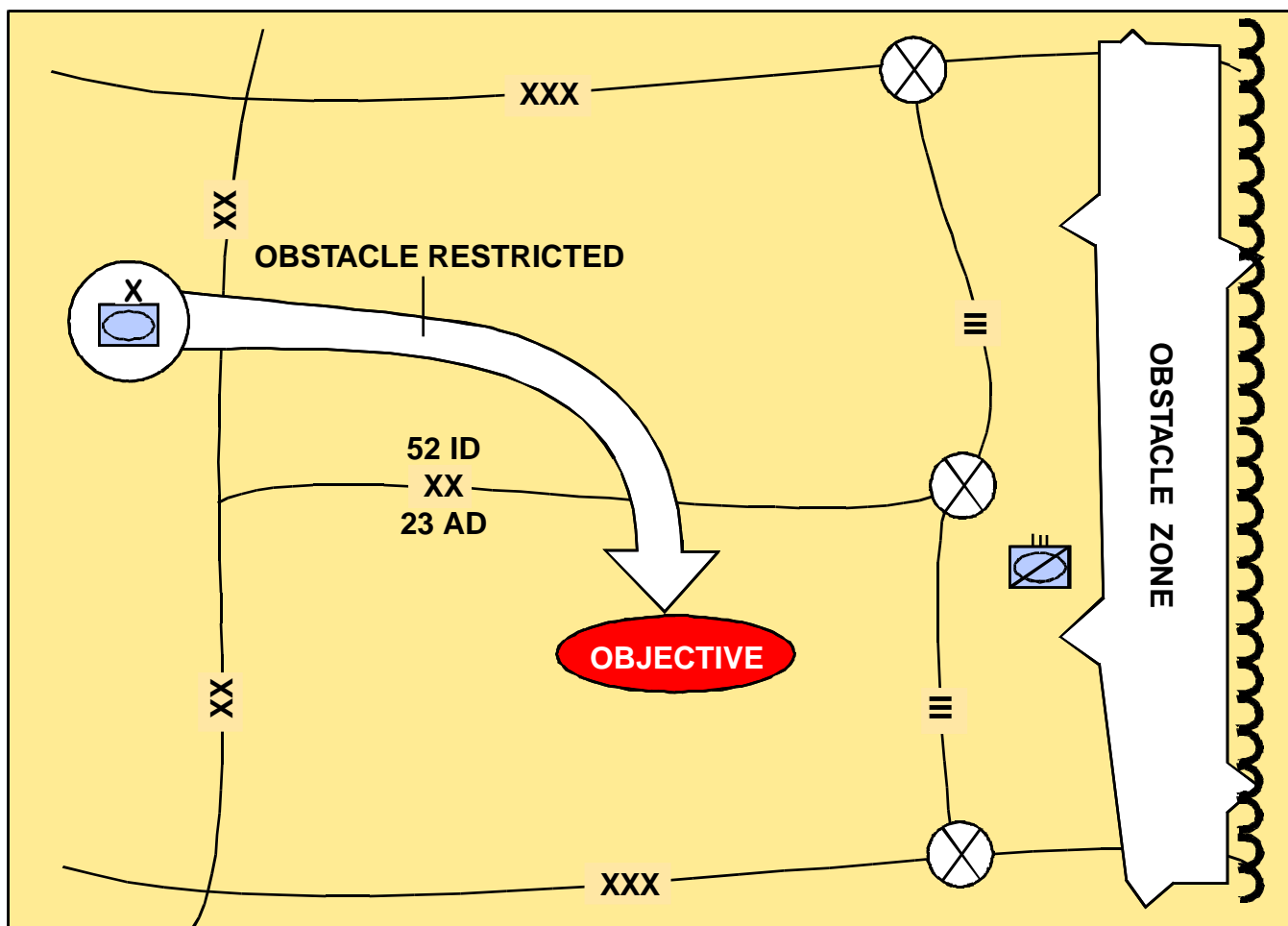
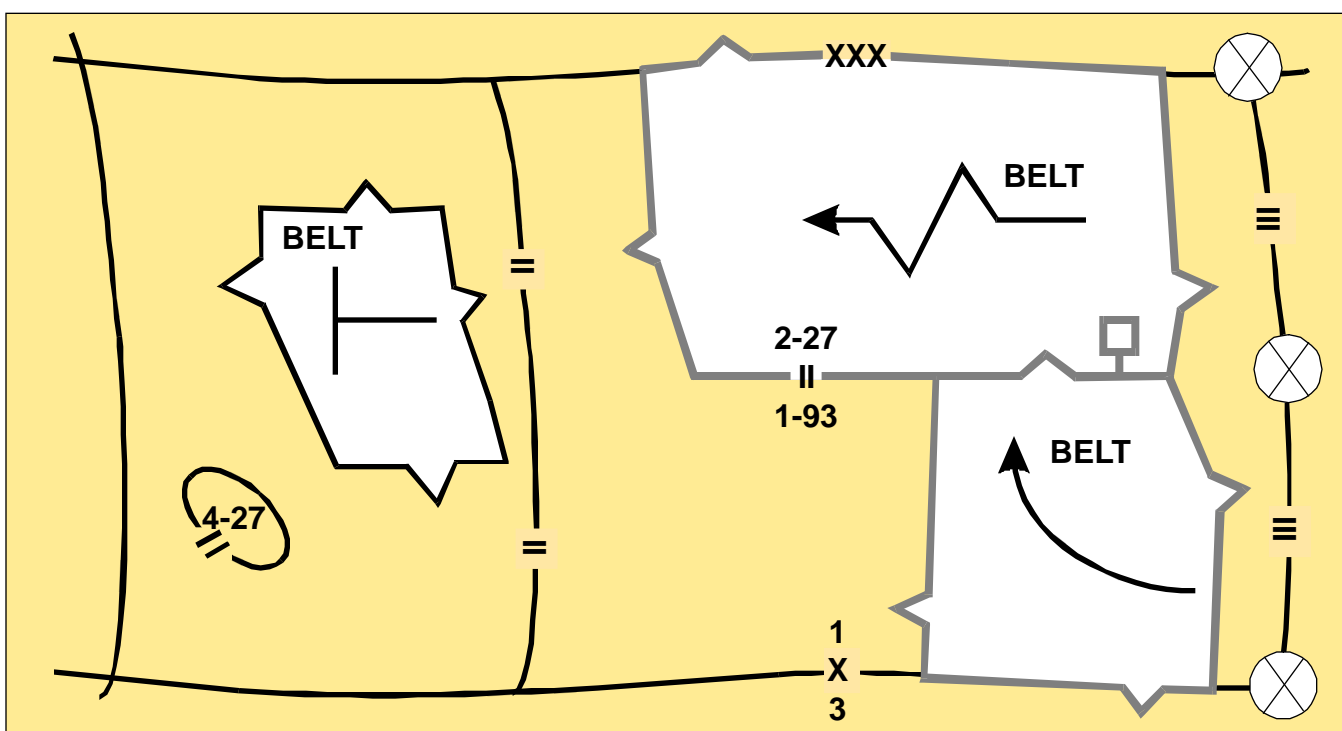
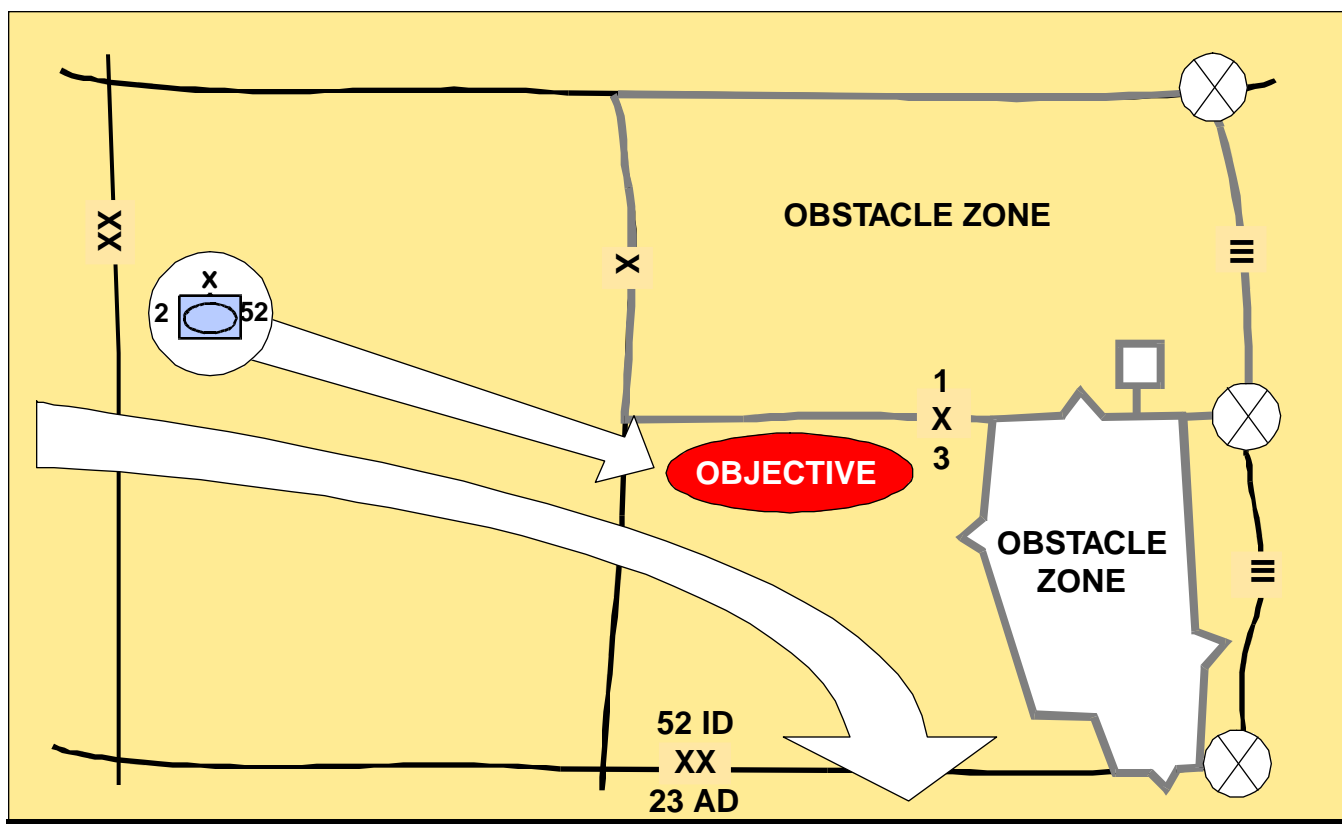


Figure 8-6. Corps Obstacle Plan (FM 90-7).



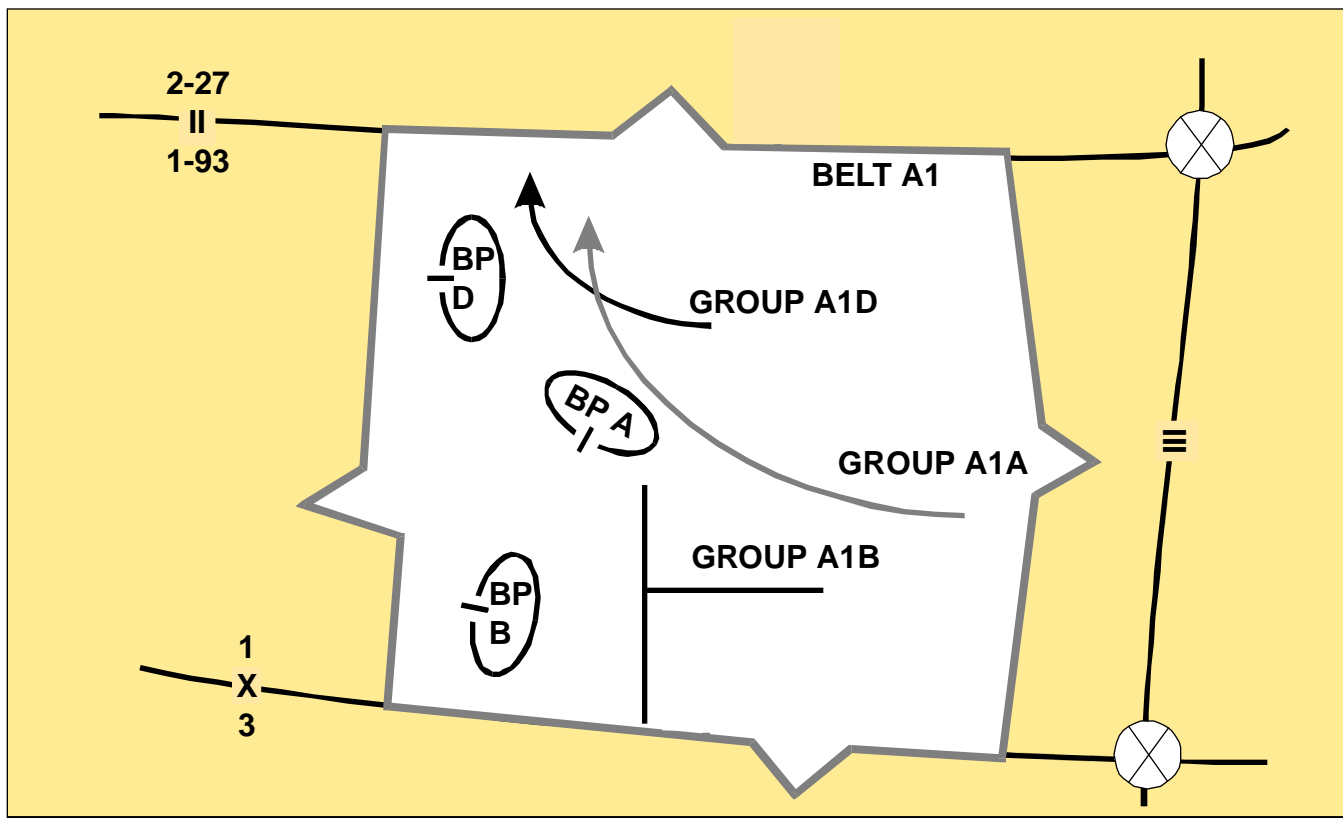


Figure 8-9. TF Obstacle Plan (FM 90-7).

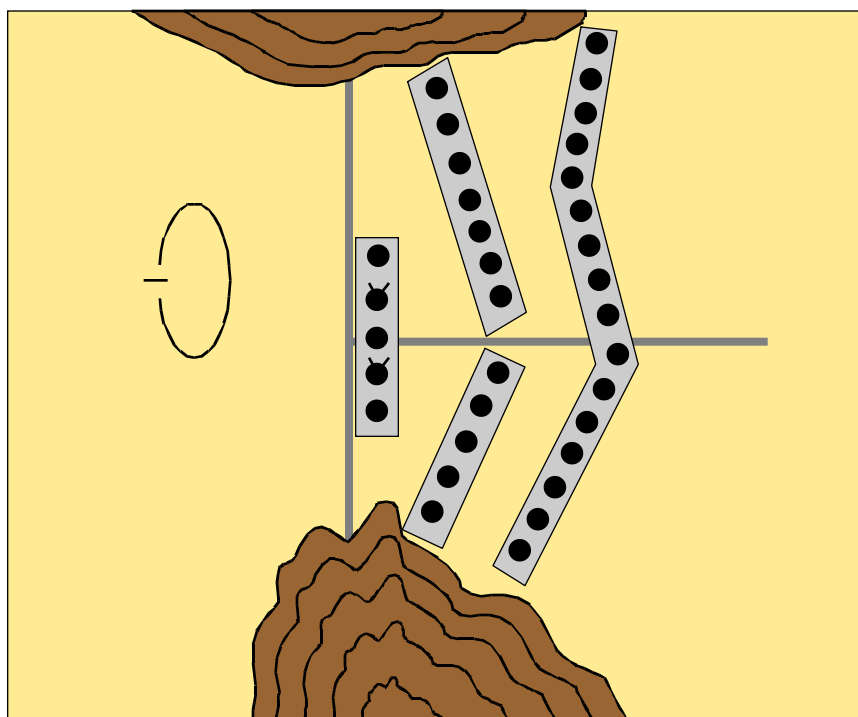


Figure 8-10. Company Team Obstacle Plan (FM 90-7).

■ OBSTACLE PLANNING AT BRIGADE LEVEL (FM 90-7) ■

Obstacle planning at brigade focuses on granting obstacle emplacement authority or providing obstacle control by establishing zones and restrictions. Commanders and staffs use mission analysis, COA development, COA analysis and comparison, decision and execution when planning obstacles.

Mission analysis determines the facts and develops assumptions, analyzes the mission, analyzes relative combat power, and issues of the commander's guidance for the force and engineer support to ensure mission success. To develop the facts and assumptions use intelligence, logistic, fire-support and engineer estimates of the current situation with respect to capabilities and limitations of both friendly and threat forces. The staff uses mission analysis, intent, AO, deception, tasks, limitations, assets available, risk, and time analysis to identify information that may have an impact on the engineer support to the mission. The staff analyzes relative combat power to determine the effect of integrated obstacles and fires on the threat. The commander's intent covers his purpose of the mission and how he visualizes the conduct and end state of the battle.

■ COA DEVELOPMENT, ANALYSIS, DECISION, AND EXECUTION ■

The purpose of COA development is to develop the maneuver in broad terms. Following this, the obstacle plan also is developed in broad terms. The development focuses on identifying the array of initial forces, developing a scheme of maneuver, determining C2 means, and preparing COA statements and sketches.

The staff COA analysis, using war-gaming techniques, will assist in determining the best COA to recommend to the commander.

Decision and execution is the final step of the decision-making process. This step will cover recommendation and decision, plans and orders, and execution and supervision. The recommendation and decision are the objective of the comparison of the COAs. Normally, the staff prepares plans and orders with the obstacle plan and the commander approves the plan or the order for execution. During the execution and supervision, to support any changes to the maneuver plan, the units continue to refine the obstacle plan.

METT-T CONSIDERATIONS FOR OBSTACLES (FM 90-7)	
METT-T FACTORS	CONSIDERATIONS
MISSION	<ul style="list-style-type: none"> - What is the mission? - What is the concept of the operation and the scheme of maneuver? - What are the required obstacle-control measures? - What is the obstacle intent?
ENEMY	<ul style="list-style-type: none"> - What are the enemy-breaching assets? - What is the likely enemy COA? - What is the most dangerous COA? - How does the enemy employ his forces and breaching assets?
TERRAIN	<ul style="list-style-type: none"> - Consider OCOKA: <ul style="list-style-type: none"> - What effect does the terrain already have on the enemy? - What is observation like? - Are cover and concealment available? - Where are the existing obstacles? - Where is the key terrain? - Where are the AAs? - How will the weather affect mobility? - How will the terrain affect mobility?
TROOPS AVAILABLE	<ul style="list-style-type: none"> - What is the status of engineer and maneuver training, experience, soldiers, and equipment? - What obstacle-emplacement assets are available? - What transportation assets are available?
TIME AVAILABLE	<ul style="list-style-type: none"> - How long before the operation begins? - How much planning time is available?
OFFENSIVE OBSTACLE PLANNING (FM 90-7)	
PHASE	OBSTACLE CONSIDERATIONS
DEEP OPERATIONS	<ul style="list-style-type: none"> - Impede enemy reinforcement by follow-on echelons - Establish the hasty defense - Fix the enemy CATK forces - Disrupt enemy C2 or CSS assets - Support counterfire operations or attacks on enemy aviation facilities
CLOSE OPERATIONS	<ul style="list-style-type: none"> - Provide flank protection during movement - Prevent enemy repositioning - Counter enemy penetrations - Fix local CATK forces - Support the unit if the attack fails - Support the unit during local enemy CATKs
REAR OPERATIONS	<ul style="list-style-type: none"> - Protect fixed CSS sites - Counter enemy deep operations

DEFENSIVE OBSTACLE PLANNING (FM 90-7)	
PHASE	OBSTACLE CONSIDERATIONS
DEEP OPERATIONS	<ul style="list-style-type: none"> - Delay or disrupt lead elements - Separate the follow-on elements - Shape the battle space
CLOSE OPERATIONS	<ul style="list-style-type: none"> - Enhance fires to support screen, guard, or cover mission - Disrupt enemy lead elements forward of the MBA - Protect the security force - Assist security-force disengagement - Close lanes/gaps after security-force withdrawal - Disrupt enemy lead elements in the MBA - Turn the enemy into the EA - Fix the enemy in the EA - Block the enemy from leaving the EA or along an AA - Protect the MBA force - Protect the flanks - Disrupt the movement and commitment of the follow-on forces - Fix the enemy reserve - Reinforce emplaced obstacles with additional obstacle effort - Support the reserve-force fires in the objective area - Protect the reserve's flank - Support the reserve's hasty defense on the objective - Hinder the withdrawal of the enemy force - Hinder the enemy's ability to reinforce the area
REAR OPERATIONS	<ul style="list-style-type: none"> - Provide force protection - Emplace tactical obstacles to counter enemy deep operations

■ BREACHING OPERATIONS (FM 90-13-1) ■

Obstacle breaching is the employment of a combination of tactics and techniques to project power to the far side of an obstacle. Breaching is a synchronized combined arms operation under the control of the maneuver commander. Successful combined arms breaching operations are characterized by applying the breach tenets; intelligence, breaching fundamentals, breaching organization, mass, and synchronization.

MANEUVER - BREACHING OPERATIONS (FM 90-13-1)

- Breaching operations make maneuver possible through threat obstacles. Since obstacles may be encountered anywhere, maneuver forces integrate in-stride, deliberate, assault, and covert breaching operations to reach their objectives.
 - In-stride breaching is a very rapid technique that uses standard actions on contact and on normal movement techniques. The in-stride breach takes advantage of surprise and initiative to get through the obstacle with a minimal loss of momentum. In-stride breaches are characterized by subordinate units being internally task organized into breach organizations.
 - Deliberate breaching is used against a stronger or more complex obstacle system. Deliberate breaching operations require significant planning and preparation. Deliberate breaches are characterized by subordinate units being organized into breach organizations.
 - Assault breaching allows a force to penetrate an enemy's protective obstacles and destroy the defender in detail. It provides a force with the mobility it needs to gain a foot hold into an enemy objective. Assault breaches are characterized by decentralized breaches at platoon and squad level.
 - Covert breaching is a special breaching operation that dismounted forces use during limited visibility. In the covert breach, suppression from the support force is a "be prepared" task upon detection of the breach force or "on order" with initiation of the assault. Stealth, quiet manual lane-reduction techniques, and dismounted maneuver characterize covert breaches.

OBSTACLE REDUCTION TECHNIQUES (FM 90-13-1)

- Mine-clearing line charge (MICLIC) is a rocket-propelled, explosive line charge used to reduce minefields containing single-pulse, pressure-activated AT mines and mechanically activated AP mines. It clears a path 100 meters long by 14 meters wide.
- Combat engineer vehicle (M728) is an M60 tank chassis with a 165mm demolition gun, which fires a 40 pound plastic explosive round. The CEV is also equipped with a dozer blade for use in dozing operations.
- Track-width mine plow and roller is a tank-mounted countermine system consisting of four plows and one roller within a tank company. The plows lift and push mines to the outside of the tank tracks leaving two 68-inch cleared paths for follow-on vehicles.
- ACE M9 is a highly mobile armored tracked bulldozer, capable of constructing earthworks and hauling small amounts of CLIV and CLV.
- M1 Breacher (Grizzly) is a M1 series tank chassis modified to breach obstacles with minimal preparation and little or no loss of momentum. The Grizzly accomplishes in-stride, full-width breach of complex obstacles.
- Armored vehicle launched bridge (AVLB) is a modified M60 or M48 chassis with quick bridging capability (up to 17 meters for military load classification (MLC) 60). For MLC 70, the AVLB provides a gap-crossing capability of 15 meters.
- Heavy Assault Bridge (HAB) (Wolverine) is a M1 series tank chassis modified to transport, launch, and retrieve MLC 70, which can span 24-meter gaps.

THE PLANNING PROCESS (FM 90-7)

Developing an obstacle plan that is effective and supports the tactical plan requires coordinated sequential planning. Use the following sequence to develop such an obstacle plan. This sequence is equally effective in both offensive and defensive operations.

- 1. Analyze the mission.**
- 2. Analyze avenues of approach.**
- 3. Analyze engagement areas, battle positions, and locations of weapon systems.**
- 4. Determine possible obstacle locations and types.**
- 5. Determine the commander's obstacle priorities.**
- 6. Determine resources.**
- 7. Determine actual work sequence.**
- 8. Determine task organization required.**
- 9. Determine coordination required.**

In the offense, the priority of the engineer effort is to maintain the mobility of friendly forces. Countermobility activities are also important to halt or slow the enemy's counterattack capability and isolate the battlefield. Such operations assist friendly forces in defeating the enemy in detail. Countermobility operations can be employed in all types of offensive operations. Obstacles and mine warfare in offensive operations have three main purposes:

- 1. Prevent enemy enforcement.**
- 2. Facilitate economy of force.**
- 3. Provide security.**

Engineer plans in support of the deep battle will resemble the support given any other offensive operation. Emphasis will be upon speed for ground forces. First priority of the engineer effort will be mobility of the maneuver force. Countermobility, in terms of flank security and prevention of counterattack, is the second priority for engineers. Obstacles will, of necessity, be those that can be installed rapidly, such as scatterable mines and road craters. Scatterable mines will be a significant contributor to success of the deep battle. Planners must carefully choose targets and delivery means.

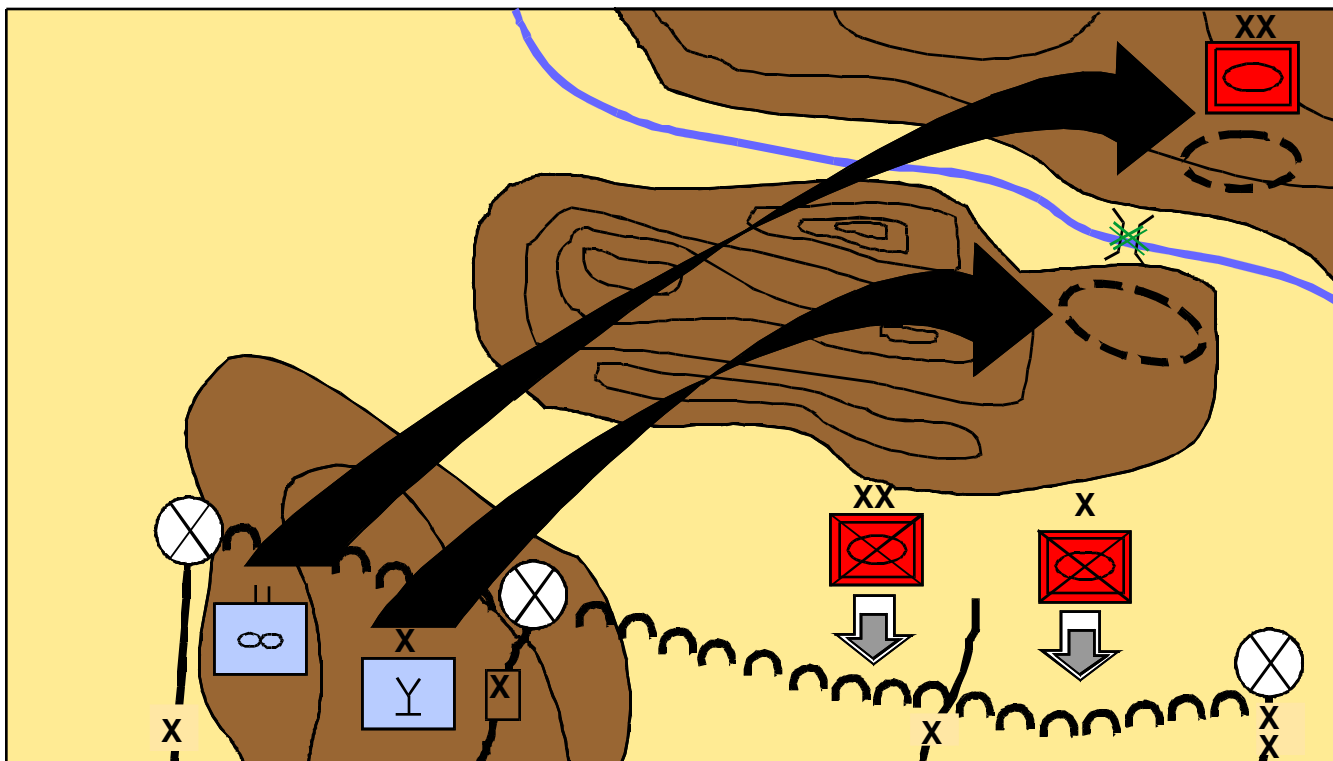


Figure 8-11. Deep Battle (FM 5-102).

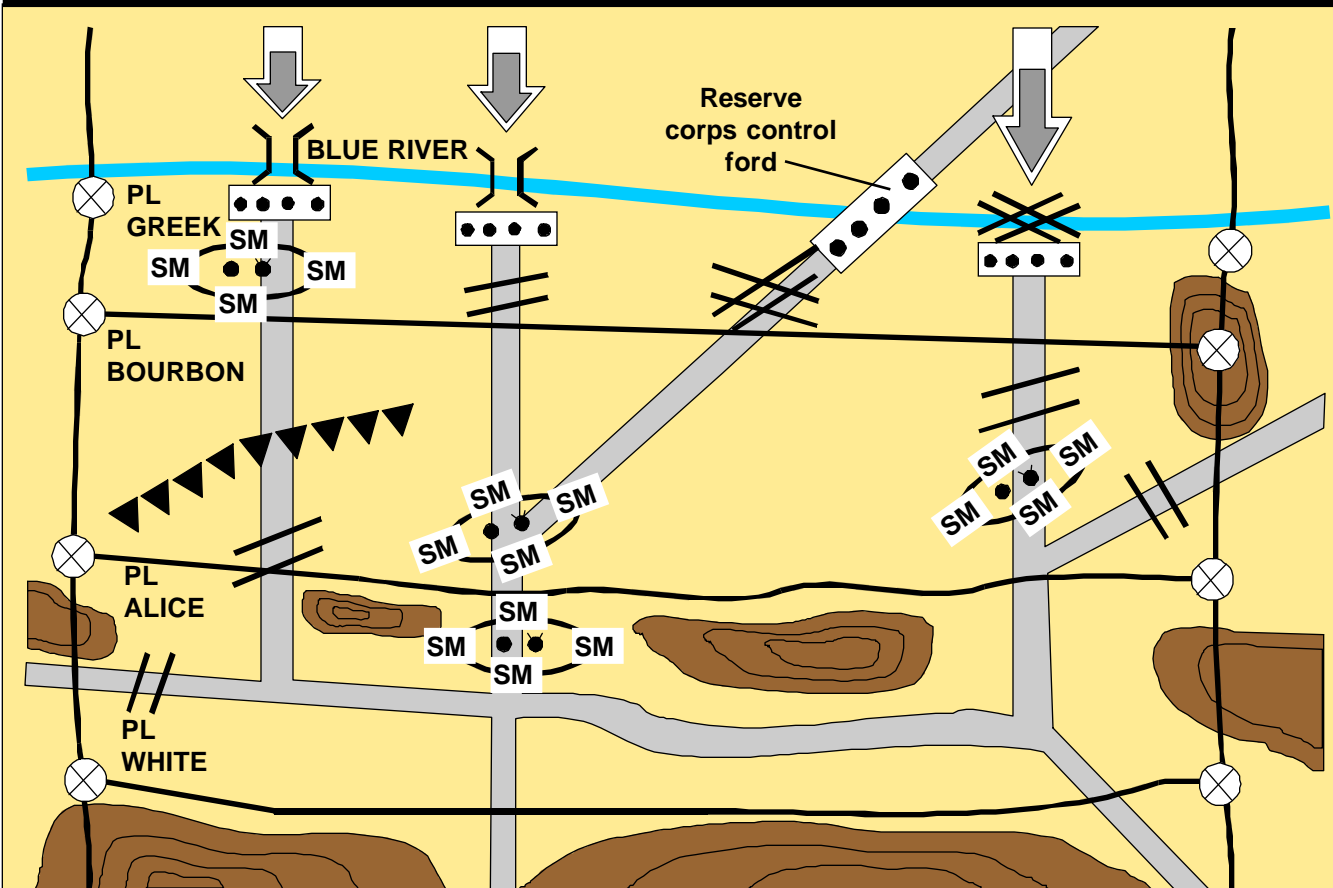
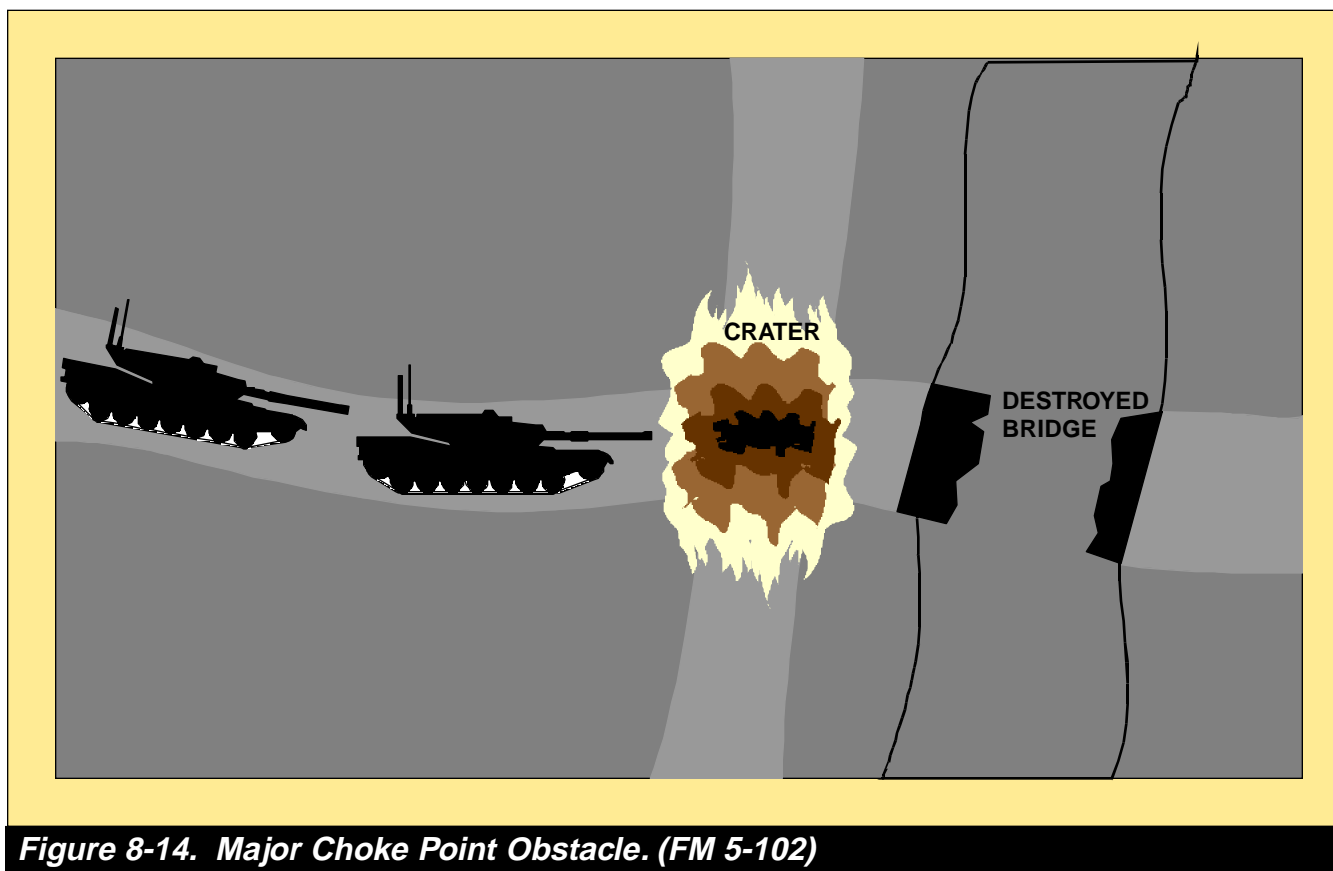
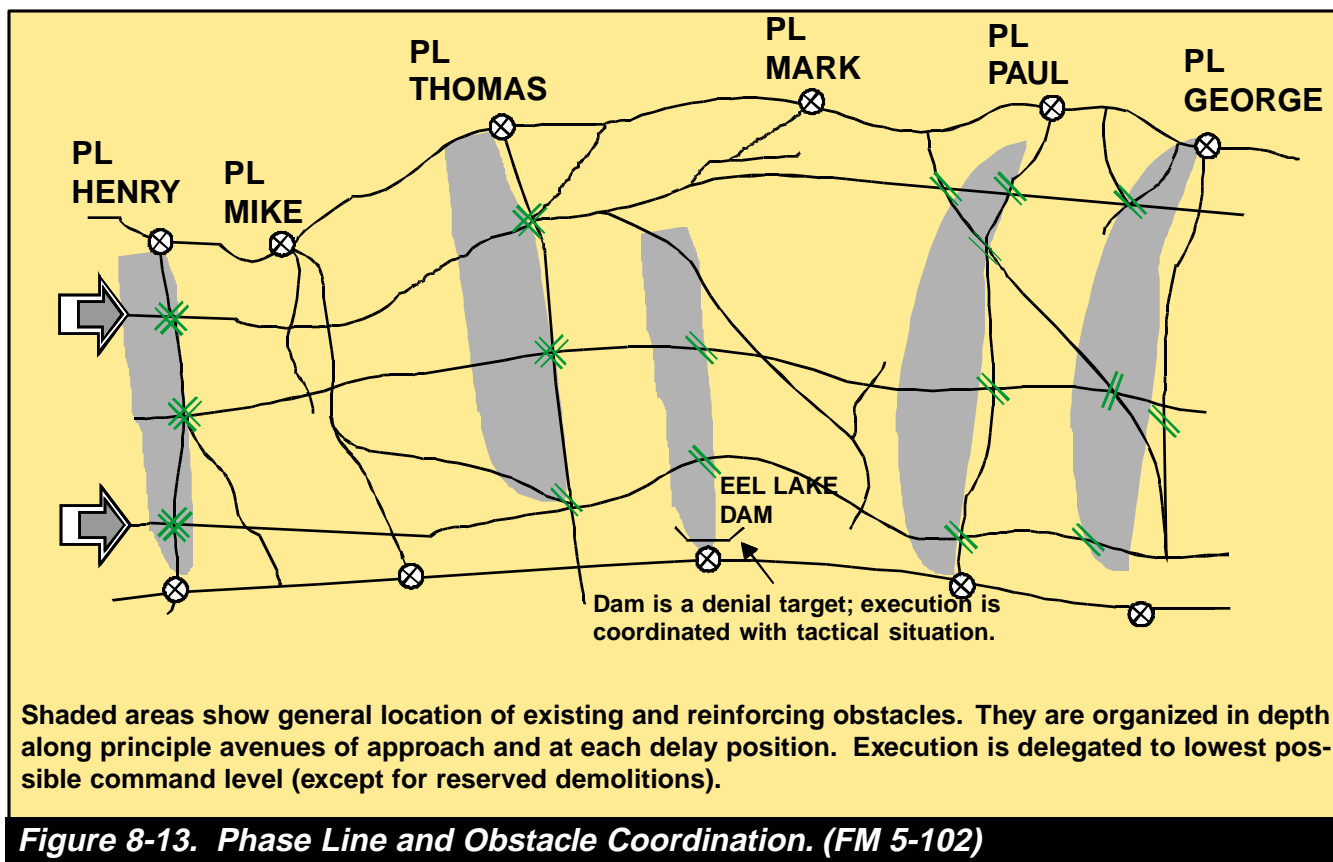


Figure 8-12. Obstacles in Retrograde Operations (FM 5-102).



MINE WARFARE (FM 20-32)

Mines destroy, delay, disrupt, and channel enemy forces. They provide a very effective means of controlling terrain and inflicting enemy casualties. Mine warfare systems are flexible. Compared with the costs of other weapon systems, mines are efficient and effective. However, their success and timely employment are factors of their availability and of the availability of transportation assets to haul them.

■ PROTECTIVE MINEFIELDS ■

Protective minefields aid units in establishing local, close-in protection. There are two types of protective minefields, hasty and deliberate.

Hasty Protective Minefields. Hasty protective minefields are used as part of a unit's defensive perimeter. Units usually lay hasty minefields using mines (conventional or scatterable) from their basic loads.

Deliberate Protective Minefields. Deliberate protective minefields are used to protect static installations, such as depots, airfields, and missile sites. Conventional mines are always used and are emplaced in standard patterns, usually by engineers. The field is always fenced, marked, and covered by fire. These minefields are usually emplaced for long periods. When these minefields are to be removed, engineers clear them.

■ TACTICAL MINEFIELDS ■

Tactical minefields are emplaced as part of the obstacle plan. These minefields:

- Channelize, delay, and disrupt enemy attacks.
- Reduce enemy mobility.
- Block enemy penetrations.
- Increase effectiveness of friendly fire.
- Deny enemy withdrawal.
- Prevent enemy reinforcement.
- Protect friendly flanks.
- Destroy or disable enemy vehicles and personnel.

■ POINT MINEFIELDS ■

Point minefields disorganize enemy forces and hinder their use of key areas. Point minefields are of irregular size and shape, and include all types of antitank and antipersonnel mines, and antihandling devices.

■ INTERDICTION MINEFIELDS ■

Interdiction minefields are placed on the enemy or in his rear areas to kill and disorganize, and to disrupt lines of communication and command and control facilities.

■ PHONY MINEFIELDS ■

Phony minefields, used to degrade enemy mobility and preserve our own, are areas of ground used to simulate live minefields and deceive the enemy. They are used when lack of time, personnel, or material prevents employment of actual mines.

■ MINE DELIVERY METHODS ■

The following table relates mines to their methods of delivery, self-destruct features, and emplacement characteristics. It also identifies those mines that may or may not be placed in a classical pattern. This table provides a basis for categorizing mines as scatterable or conventional, according to their self-destruct feature. The following tables list mines by category, and also provide additional characteristics of each mine.

CONVENTIONAL AT MINE CHARACTERISTICS (FM 20-32)							
MINE	SAFE ARM TIME	FUZING	WARHEAD	AHD	EXPLOSIVE WEIGHT	MINE WEIGHT	MINES PER 5-TON DUMP
M15	NA	Pressure	Blast	Yes	22 lb	30 lb	90
M15 w/M624 FUZE	NA	Tilt Rod	Blast	Yes	22 lb	30 lb	90
M19	NA	Pressure	Blast	Yes	21 lb	28 lb	196
M21	NA	Tilt Rod	Shaped Charge	Yes	11 lb	17 lb	192

CONVENTIONAL AP MINE CHARACTERISTICS (FM 20-32)							
MINE	SAFE ARM TIME	FUZING	WARHEAD	AHD	EXPLOSIVE WEIGHT	MINE WEIGHT	MINES PER 5-TON DUMP
M14	NA	Pressure	Blast	No	1 oz	3.3 oz	6,480
M16A1	NA	Pressure Trip Wire	Bounding Frag	Yes	1 lb	8 lb	672
M18A1	NA	NA	Directional Frag	No	1.5 lb	3.5 lb	1,782
M86 (PDM)	NA	NA	Bounding Frag	100%	21 gr	1 lb	NA
NOTE: The M86 (PDM) mine self-destructs in 4 hours.							

SCATTERABLE AP MINE CHARACTERISTICS (FM 20-32)

Mine	Delivery System	Arming Mechanism	Safe Arm Time	Fuzing	Warhead	AHD	Self-Destruct Time	Explosive Weight	Mine Weight (lb)	Mines per 5-ton Dump
M72	155 mm artillery (ADAM)	1-G force 2-spin	45 sec 2 min	Trip Wire	Bounding fragment	20%	48 hr	21 grams Comp A5	1.2	36 per M692
M67	155 mm artillery (ADAM)	1-G force 2-spin	45 sec 2 min	Trip Wire	Bounding fragment	20%	4 hr	21 grams Comp A5	1.2	36 per M731 projectile
M74	GEMSS Flipper	1-spin 2-electric	45 min	Trip Wire	Blast fragment	20%	5 days 15 days	1.2 lb Comp B4	3.2	1,600
BLU 92/B	USAF (Gator)	1-bore pin 2-electric	2 min	Trip Wire	Blast fragment	100%	4 hr 48 hr 15 days	1.2 lb Comp B4	3.2	NA
M77	MOPMS	1-bore pin 2-electric	2 min	Trip Wire	Blast fragment	0%	4 hr (recycle up to 3 times)	1.2 lb Comp B4	3.2	30 modules (120 mines)
Volcano	Ground/Air	Crystal oscillator	4 min	Trip Wire	Blast fragment	0%	4 hr 48 hr 15 days	1.2 lb Comp B4	3.2	160 canisters (160 mines)

SCATTERABLE AT MINE CHARACTERISTICS (FM 20-32)

Mine	Delivery System	Arming Mechanism	Safe Arm Time	Fuzing	Warhead	AHD	Self-Destruct Time	Explosive Weight	Mine Weight (lb)	Mines per 5-ton Dump
M723	155 mm artillery (RAAM)	1-G force 2-spin	45 sec 2 min	Magnetic	M-S plate	20%	48 hr	1.3 RDX	3.8	9 per M718 projectile
M70	155 mm artillery (RAAM)	1-G force 2-spin	45 sec 2 min	Magnetic	M-S plate	20%	4 hr	1.3 RDX	3.8	9 per M741 projectile
M75	GEMSS Flipper	1-spin 2-electric	45 min	Magnetic	M-S plate	20%	5 days 15 days	1.3 RDX	3.8	1,600
BLU 91/B	USAF (Gator)	1-bore pin 2-electric	2 min	Magnetic	M-S plate	No	4 hr 48 hr 15 days	1.3 RDX	3.8	NA
M76	MOPMS	1-bore pin 2-electric	2 min	Magnetic	M-S plate	No	4 hr (recycle up to 3 times)	1.3 RDX	3.8	30 modules (510 mines)
Volcano	Ground/Air	Crystal oscillator	2 min 30 sec	Magnetic	M-S plate	No	4 hr 48 hr 15 days	1.3 RDX	3.8	160 canisters (800 mines)

■ TYPES OF MINEFIELDS ■

- Preplanned conventional and scatterable minefields will be part of the obstacle plan that the engineer develops for the commander. Employment will be coordinated with higher, lower, and adjacent units prior to execution, and reported and recorded afterwards.
- Conventional minefields will normally be emplaced prior to the beginning of hostilities because of the necessary exposure of manpower and equipment, and because of the length of time necessary to emplace them.
- Scatterable minefields can and should be planned and emplaced throughout the battlefield as the tactical situation requires and assets allow. Ground scattering systems are best utilized for emplacing larger tactical minefields and rapid, small, point, or hasty minefields. Other scatterable systems, such as Artillery, Gator, M56, and Volcano, can be employed throughout the battlefield.

■ TYPES OF LAND MINES ■

Conventional mines are those mines **not** designed to self-destruct. Conventional mines are designed to be directly emplaced by hand or by mechanical mine-planting equipment.

Scatterable mines are those mines that are designed to self-destruct after a set period of time. With the exception of the Wide Angle Side Penetrating Mining System (WASPMS), which is directly emplaced, remotely deliver scatterable mines ground systems, artillery, helicopters, and high-performance aircraft. Scatterable mines will be employed against enemy units anywhere on the battlefield.

NOTE: *Be aware of the terms “scatterable” and “Family of Scatterable Mines (FASCAM)” when referring to specific systems and their employment. Those generic terms are only applicable in the most general sense when discussing doctrine. Whenever possible, refer to the specific delivery system and the characteristics of that system, rather than using the generic term.*

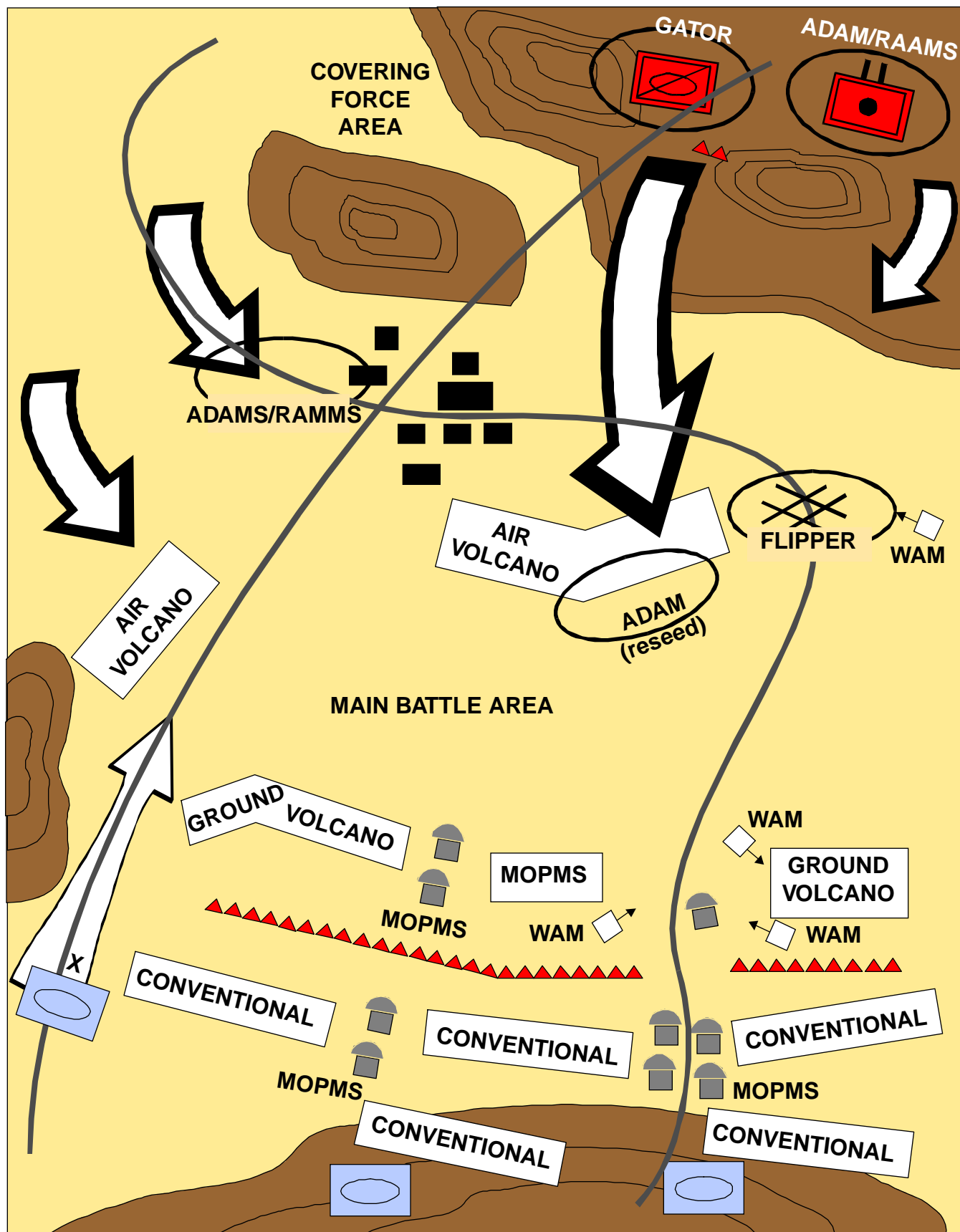


Figure 8-15. Typical Minefield Employment.

■ NUCLEAR, BIOLOGICAL, AND CHEMICAL (NBC) SUPPORT (FM 3-100) ■

While the support discussed below may not always be task-oriented down to task-force level, the task force commander must know what is available so that he can request it, should the need arise.

CHEMICAL COMPANY (FM 3-5)

The chemical company (Heavy Division [Active Component]) provides the division with four decontamination platoons, a reconnaissance platoon, and one smoke platoon. Each decontamination platoon is equipped with three M12A1 power-driven decontaminating apparatuses (PDDA) mounted on 5-ton trucks. The smoke platoon is equipped with six M1059 smoke generating systems. (Additionally, there are two organic M17 lightweight decontamination systems per battalion.)

A decontamination platoon may be attached to, OPCON, direct support of, or general support of, a brigade.

NBC RECONNAISSANCE PLATOON

One NBC reconnaissance platoon is organic to the division chemical company. When persistent contaminants are expected, the division may attach an NBC reconnaissance element to a maneuver brigade.

- In the offense, a reconnaissance squad may move with the leading battalion task force along a route where the threat of contamination is greatest.
- In the defense, reconnaissance squads operating in the main battle area determine the extent of contamination and locate sites for thorough decontamination.

SMOKE EMPLOYMENT (FM 3-100)

Smoke can degrade effectiveness of both personnel and weapons systems. Smoke can have both psychological and physiological effects on personnel, and it may defeat or degrade optical or electro-optical sights and target acquisition devices. The task force commander must consider using smoke to aid his scheme of maneuver.

■ PURPOSE ■

- During offensive operations, the use of smoke conceals units and individual weapon systems.
- During defensive operations, the use of smoke can separate and isolate attacking echelons. This can create gaps in enemy formations and disrupt planned movements.
- Smoke helps to disorient and confuse the enemy.
 - Smoke is useless unless employed in quantity.

- Smoke effectiveness depends on weather conditions, and wind direction and speed.
- Smoke is valuable during limited visibility; smoke adversely affects passive and infrared night vision devices (NVDs).

■ TYPES ■

The battalion employs smoke for four general types of applications on the battlefield: obscuration, screening, marking and signaling, and deception.

■ SOURCES ■

The task force normally has ready access to six systems that can produce smoke for tactical operations.

1. Mortars can create a high volume of smoke at midranges in a specific area. They are, in fact, the most rapid and effective means of indirect smoke delivery available to the maneuver commander.
2. Field artillery cannons primarily can place two types of smoke-producing munitions rapidly on distant targets: white phosphorus (WP) and hexachlorethane (HC).
3. Smoke pots produce large volumes of white or grayish-white smoke for extended periods. They are the unit commander's primary means of producing small area smoke screens that last 10 to 15 minutes. A number of M1 or ABC-M5 smoke pots can be arranged to ignite in succession. This provides smoke for a longer period than a single pot. For chain ignition, the pots can be placed in stacks and the top pot in the stack ignited; or they can be laid on their sides end to end and the pot with the exposed igniting device ignited.

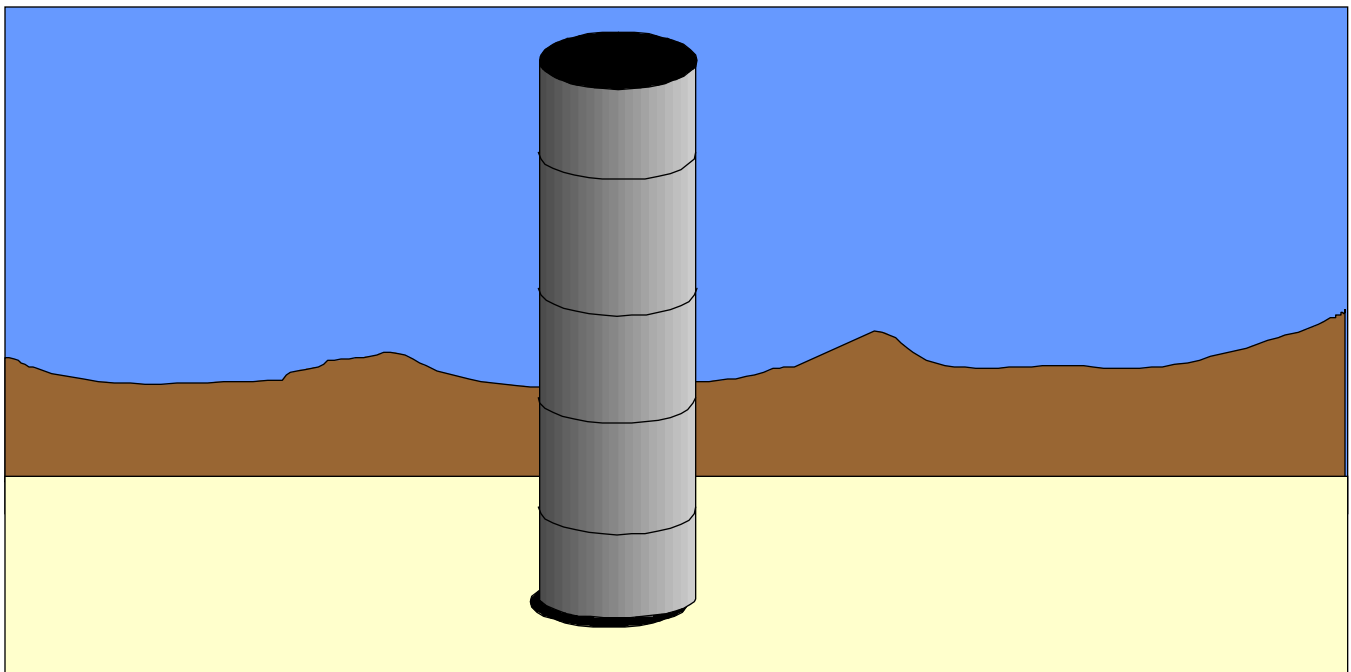


Figure 8-16. Smoke Pots Stacked Vertically.

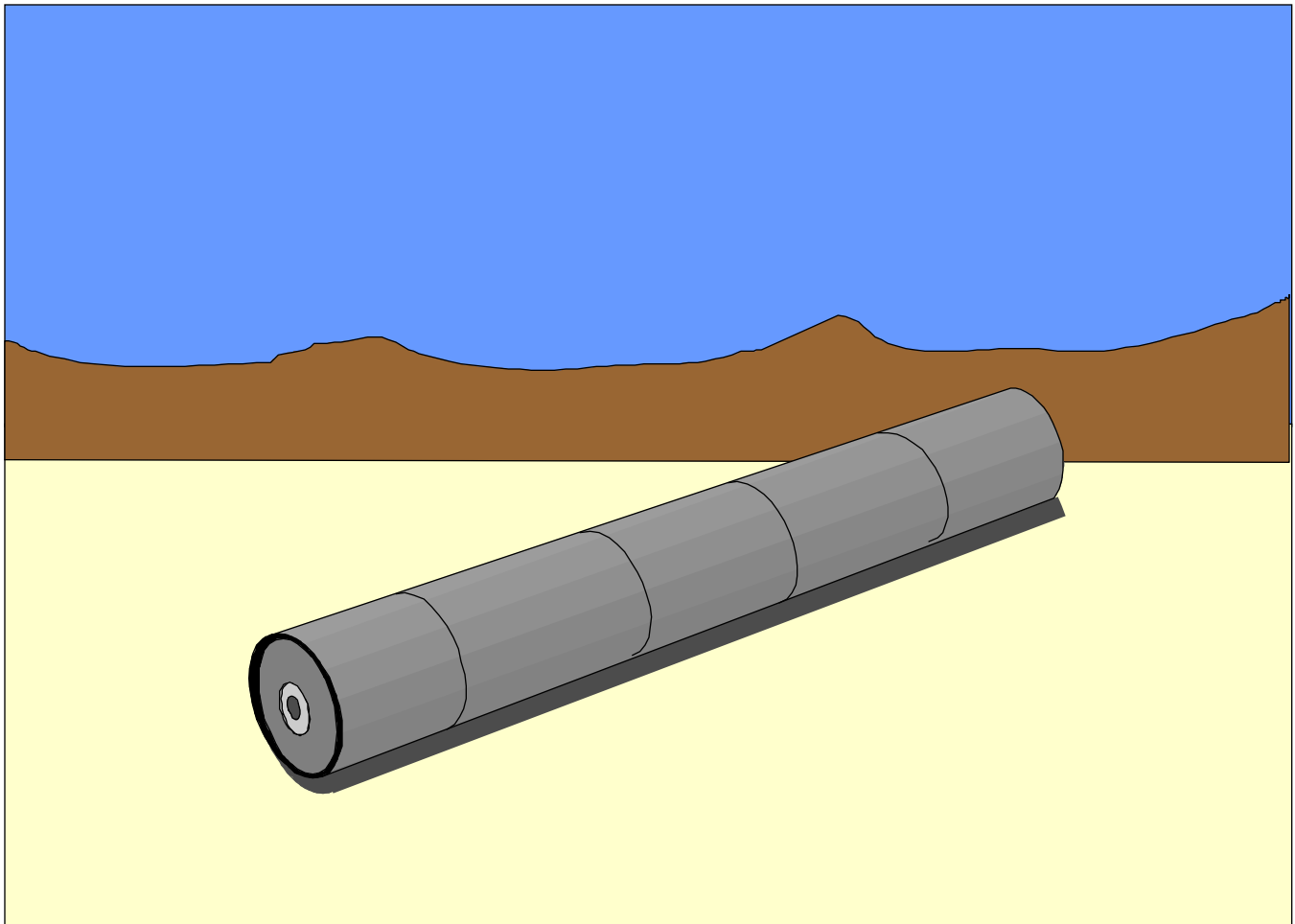


Figure 8-17. Smoke Pots Laid End to End.

■ PLANNING CONSIDERATIONS ■

- You must plan the use of smoke for each operation and for all conditions, including day and night.
- To put smoke where it is wanted and to keep it there, you must plan, control, and adjust smoke operations much as artillery fire.
- Smoke limits maneuver capability.
- You should not routinely place smoke on suspected enemy positions. A more efficient use of smoke would be to place it close to the enemy but between friendly and suspected enemy positions.

■ SMOKE IN THE OFFENSE (FM 3-100) ■

Before the battle, smoke denies the enemy information about the composition and disposition of friendly forces. It screens tactical assembly areas (TAAs) and forward assembly areas (FAAs). During offensive operations, smoke defeats enemy target acquisition and surveillance. Smoke conceals maneuver and combat support forces.

It contributes to deception operations. Friendly forces use projected, generated, and self-defense smoke to:

- **Mark targets.**
- **Obscure the vision of enemy gunners and surveillance.**
- **Degrade enemy command, control, and communications.**
- **Conceal passage of lines, movement to contact, and hasty and deliberate attacks.**
- **Conceal landing zones (LZs), drop zones (DZs), or pickup zones (PZs). (For friendly LZs, DZs, and PZs, place smoke to restrict enemy observation without interfering with friendly operations).**
- **Conceal logistics operations (for example, fast refuel sites).**
- **Send signals.**
- **Support deception plans.**
- **Degrade enemy laser designators, range finders, and weapons.**
- **Enhance the effectiveness of artillery-delivered minefields by concealing their visual indicators.**

■ SMOKE IN THE DEFENSE (FM 3-100) ■

In the defense, forces use smoke primarily to increase survivability and to counter enemy reconnaissance, surveillance, and target acquisition. Forces use smoke in the defense to:

- **Obscure the vision of enemy direct-fire gunners and artillery forward observers.**
- **Disrupt enemy movement and command and control.**
- **Conceal obstacle emplacement, prepare battle positions, and move to alternate positions.**
- **Conceal reconstitution, holding, and staging areas.**
- **Conceal MSR activities.**
- **Send signals.**
- **Mark targets.**
- **Deceive the enemy as to areas of main effort and battle positions.**
- **Reduce the effectiveness of enemy directed-energy weapons.**
- **Enhance air defense by degrading nap-of-earth flight patterns and forcing the enemy to fly higher.**
- **Silhouette targets.**
- **Support MOUT operations.**